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**INFORMATION MANAGEMENT, MANAGED CARE,
AND THE PATIENT-PROVIDER RELATIONSHIP**

BY

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USAWC STRATEGY RESEARCH PROJECT

**Information Management, Managed Care, and the
Patient-Provider Relationship**

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ABSTRACT

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This paper examines changes in health care delivery, from fee for service and acute care oriented to managed care and prevention oriented. It examines trends in computers and communication, and uses business models to provide a new paradigm for patient-provider centered information systems. Patient-provider centered information systems allow proactive application of new prevention, health promotion and clinical practice guidelines, while decreasing omissions of care through inattention or system failures. In addition, they allow provider implementation of population based health care by identifying patients whose care deviates from guidelines, or defining populations of patients needing additional care. Implementation of this paradigm will strengthen the patient-provider relationship, and improve overall health of the population. Finally, the paper suggests new directions for further application of information technology to health care.

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In recent years, health care in the United States has changed tremendously. It has moved from primarily fee for service payment to managed care financing. It has moved from almost complete physician decision-making autonomy to imposition of significant restraints by managed care firms or insurance companies. Its focus has moved from acute care to disease prevention and health promotion. Advances in prevention, diagnosis and treatment of disease are so rapid that it is difficult for providers and patients to keep up with those changes.

Other industries have also changed significantly. The power of computer processors has skyrocketed while costs have plummeted. The cost of storage has decreased exponentially. The software industry has taken advantage of this increased power and inexpensive storage to build larger, more complex, and more powerful programs that are easier for non-technical people to use. The communications industry is laying more fiber-optic cable and digitizing the airwaves to provide more bandwidth for wireless communication and data transmission. Digital technology is tremendously increasing the capability of current telephone lines, making faster Internet access available to home users.

The entertainment industry is introducing extremely fast cable access to the Internet. Existing companies are using the Internet to provide product and service access for customers. New companies who do business only on the Internet are proliferating. The introduction of non-traditional computers V set-top boxes) that work with televisions and telephone lines will enable those who do not own computers to access the Web.

We need to look at trends in health care to see how they affect the patient-provider relationship. We need to see how we can leverage new developments in other industries to help bolster that relationship, meet the new demands of managed care, prevention, and health promotion, and improve the overall health of our patient population.

MANAGED CARE, HEALTH PROMOTION, AND PREVENTION

Managed care began in Tacoma, Washington in 1910, at the Western Clinic.¹ It was designed as a way to insure income for a group of physicians at that clinic. From this beginning, managed care slowly spread. One of the largest and best-known plans, Kaiser-Permanente, began in 1937 in California.²

Managed care accelerated in the 1970s as a result of concerns about how to contain rising Medicare costs. The Health Maintenance Organization (HMO) Act of 1973 led to funding for HMO start-ups and expansion, and also mandated

that employers of more than 25 people who offered regular health insurance policies offer HMO enrollment.³

Managed care is now seen as a way to contain health care costs. Techniques include pre-certification to be admitted to a hospital, case management to ensure patients don't stay in the hospital too long, and utilization management to insure appropriate use of resources in patient care. They also include financial incentives to providers to decrease unneeded care, while increasing prevention or early detection of disease, and patient education and self-care.⁴

In strict HMOs, primary care providers are known as gatekeepers.⁵ The primary care provider must authorize any care given to his patient by another provider. This can create tension if patient and provider do not agree on the need for specialty consultation. Patients see the provider as a barrier to care, especially if they believe that the provider has a financial incentive not to refer. In fee for service, the provider had few disincentives to refer, since doing so made the patient and the receiving provider happy. Utilization management may monitor a provider's referral patterns. Providers who refer too much could be penalized by having performance bonuses withheld.

Providers in fee for service plans were once able to admit and discharge patients from the hospital as they

pleased. Cost was not an issue, as long as patients had insurance and could afford the deductibles and co-payments. Now, both managed care plans and traditional insurance plans require providers to obtain pre-certification before admitting patients to the hospital. Additional permission is required to keep patients in the hospital longer than a set number of days typical for the diagnosis.

Case management developed to prevent long-term hospital stays by identifying those patients who were outliers: patients who had been in the hospital longer than usual for their diagnoses. Managed care organizations usually try to transfer these long term patients to facilities providing care at a level more specific to their needs, and at less cost than a full- service hospital.

The ambulatory care equivalent to case management, disease management, developed as intensive follow-up of chronically diseased patients as outpatients.⁶ Non-physician providers specializing in particular chronic diseases follow patients between their regular physician appointments, adjusting the frequency of contact according to the patients' condition. Since they are closely attuned to the patients' condition, they can detect problems early. This allows early intervention when health deteriorates, reducing the likelihood of hospitalization, thus saving money and improving patient quality of life.

Prevention programs, wellness programs, and early detection programs overlap: some see little difference between wellness and prevention. Early detection programs include screening for colon cancer (either by flexible sigmoidoscopy or by testing for blood in feces), testing for early breast cancer by mammography and breast examination, and detection of early prostate cancer by prostate examination and blood prostate specific antigen testing. Prevention programs include nutrition counseling, physical fitness counseling, and counseling to prevent motor vehicle injuries.⁷

All these programs require provider time and awareness of requirements to counsel, examine, or test. It is difficult for a provider who sees individual patients only occasionally to remember all of the screenings that apply to the particular patient in his office. Opportunities for review and counseling are often piggybacked onto appointments made for another reason; there is little time for review of these requirements, much for less counseling or testing.

Another focus of managed care is population-based health care. This refers to provider use of screening, diagnosis, or treatment guidelines that have been shown to improve current or future health.⁸ Prevention, wellness, and early detection programs are included. Treatment of

common diseases such as diabetes, congestive heart failure, and asthma are amenable to this approach, which seeks to reduce the variation in the care given to different patients with the same disease. This is easily done when the guideline is first published, if the provider has the means to quickly identify all patients to whom the guideline applies. He can then begin treating all those patients uniformly, calling patients in who need immediate implementation, and applying the guidelines to all others during the very next encounter.

Changes in medical practice and health care financing have resulted in changes in the patient-provider relationship. These changes have led to some patient distrust in the gatekeeper function of providers, complaints that hospital stays are being shortened based on budgetary rather than medical reasons, and concern about possible provider financial interest in reducing availability of care. Provider time spent with patients is a chronic recurring issue regardless of payment system: most patients say that time is too short.

If these new approaches to care that we have discussed were taken together, they would integrate the medical system into a holistic provider of health care to patients. It would lead to improved individual patient health, and applied globally, to improved health of the entire

population. Certainly, it would alleviate many of the current problems in the patient provider relationship. How can we integrate all these programs?

COMPUTERS, COMMUNICATION, AND THE INTERNET

Moore's Law says that the power of microprocessors will double every 18 to 24 months.⁹ This law is projected to hold until at least 2011, when chips will contain one billion transistors.¹⁰ Progression beyond that is uncertain due to limitations of materials and the laws of physics, but we will have increasingly powerful computers.

Similar progress has occurred in storage, both random access memory and disk drives. Even low-end computers routinely ship with 64 megabytes of random access memory; a far cry from the 128 kilobytes high-end machines shipped with just fifteen years ago. Disk drives progressed from fifty-platter 24" five megabyte IBM drives of the 1950s to four- or five-platter 3.5" drives holding up to 18 gigabytes of data. Gateway's least expensive computer (\$999) ships with a 4.3 gigabyte hard drive and a 400MHz AMD K6-2 processor.¹¹ People reading this paper a year from now will marvel that we paid that much.

The power of even relatively inexpensive computers is tremendous, more than is necessary for most current consumer software programs. These improvements in storage, memory, and processor power mean that programs can include much

more functionality through easy to use interfaces. The days of command line computing are over for most people: programmers design powerful software for intuitive use by non-technical professionals.

Modems, which most home computers use to access the Internet, have gone from 1200 baud in early commercial models, to 56kbaud now. Modems are still low bandwidth, but entirely adequate at 36.6kbaud to 56kbaud to provide speedy Net access. New ways to use telephone lines for digital transmission (digital subscriber line) rather than the analog transmission of modems promises to speed access up to 1.5 megabytes per second.¹²

Cable modems, which can allow up to 10 megabytes per second, are also becoming popular, and can be left on 24 hours a day. Satellite TV services can also be used for high speed Internet access. The last method of Internet access, WebTV, is essentially a Web-dedicated computer that hooks up to the television and a telephone line. This provides Internet access at a lower price than buying a separate computer and modem.

Electronic mail (e-mail) access is quite easy: Excite, MailCity, MSN, and Yahoo!, among others,¹³ offer free e-mail accounts. Yahoo! claims you have it for life. All that is necessary is Internet access, whether from business, home, community center, or Internet café. This mode of

communication is important because it is asynchronous. Face to face talks, as in appointments, have to place two people together in both space and time. Telephone conversations allow people to talk without proximity. Voice mail and e-mail allow complete asynchrony in both space and time. This is not to say that the telephone and appointments will not be necessary. This widens the spectrum of tools people can use to communicate. With time, we will find that much of our time- and space-neutral communication will be by e-mail.

BUSINESS MODELS

What do these parallel processes mean to each other? How can the tremendous improvements in the speed, power, and connectivity of computers and the Internet apply to the new mandates of managed care to promote health and contain costs?

A computer industry visionary, Bill Gates, talks about a leader in the financial services industry:¹⁴

At the heart of Merrill Lynch's concerns was the need to improve the efficiency of the company's most valuable asset, its financial consultants (FCs). Merrill Lynch's financial consultants were spending a great deal of their time tracking down data--stock quotes, research reports, customer account data, Merrill Lynch product information, interest rates, and other widely dispersed information--and less of their time acting as financial advisers.¹⁵

This sounds remarkably similar to the problems of health care providers, who spend a lot of time tracking down test results, patient information, practice or referral

guidelines, and other information, and not enough time counseling and teaching patients.

When Merrill Lynch redesigned its information system, it did so "...around the information flow its financial consultants needed. The new system had to be 'FC-centric,'..."¹⁶ The outcome of this redesign caused a paradigm shift for financial consultants, allowing them more time to concentrate on their clients. A vital factor in that redesigned system is a centralized electronic file containing all records of client contacts.¹⁷ This allows anyone on the phone with the client to review other recent contacts and see what reports, calls, meetings, or services are pending and who is responsible.

The boldest Merrill Lynch decision, however, was to allow client access to a slightly less powerful version of this information system over the Internet.¹⁸ Clients can look at much of the same financial information at their own time and pace, after which they can call their FC for additional perspective and advice. In addition, clients access other services such as placing orders and paying bills.

Health care organizations need to design their information systems so that they are "health care provider-centric," or "patient-provider relationship-centric," rather than management-centric, as they now are. And they should

allow or even promote patients' access to their own prevention and wellness information on the organizational Web site.

As a classic example of prevention, Gates discusses Jiffy Lube's plans to transfer information on individual cars, now stored on local shop databases, to a centralized national database.¹⁹ If a Jiffy Lube customer goes to a shop anywhere in the country, his car's history is available. When the job is done, that record is updated. It also records information about marketing. Were coupons used? If so, what marketing program did those coupons come from? This enables Jiffy Lube to target marketing programs to certain demographic groups. Last, Jiffy Lube is planning to post a Web site where customers can access their own cars' records and the manufacturer recommendations on maintenance. They will also be able to record their preferences about reminders (mailed reminders versus e-mail).

How could this automotive prevention model apply to health care? There are many recommendations about prevention, wellness, and early detection. Every patient contact is an opportunity to implement a recommendation. If unmet recommendations are highlighted each time the patient is seen in any clinic, it is much easier to address those recommendations. If providers know what is most effective at bringing a particular patient in for prevention

screening, e.g., mailed reminder note, e-mail, or phone call, then he can use that method for all reminders to that patient.

Patients who have access to their prevention and wellness needs via the Web could schedule health maintenance appointments to address multiple issues at the same time. Counseling could be available as information sheets or PowerPoint® presentations on the Internet, with that intervention automatically recorded. Whenever patients accessed their health care Web site, they could see pop-up reminders of upcoming screening needs. During national programs for cancer awareness or smoking cessation, material might be sent to targeted groups, such as tobacco users or patients not current in cancer screening, rather than to the whole population.

A third concept that Gates discusses is customer relationship management, of which data mining is a large part. In this concept,

Information technology helps companies manage customer relationships on a one-to-one basis instead of on the mass-marketing model. Data mining is actionable for reaching the individual customer when there is a channel for customized delivery, whether it's an ATM or a Web site or direct marketing via e-mail promotions and offers. With the patterns revealed by data mining, you can present your products to a customer in a way that's most likely to increase your value to him and his value to you.²⁰

Looking through large data sets to find patterns can lead to unexpected or even counter-intuitive findings. For

example, a provider looking through his patient panel data set might find that immunization rates for children overall are quite good. Sorted by zip code, however, he might find a very low rate in one zip code area. If other providers in his organization confirm this trend, they might focus on immunization marketing efforts in that zip code area, or set up a mobile immunization clinic program there.

Mining large data sets also looks for exceptions from the norm that might respond to individual attention. Some patients take charge of their health, and routinely comply with all screening and prevention measures without prompting. It would be unneeded effort to send them mailings or call them to remind them, and it might even be irritating. Others are not so compliant, but respond to e-mail reminders, so mailed cards are redundant. Still others respond only to phone calls, so letters or e-mail are superfluous. Providers can select interventions that work, rather than attempting to increase compliance by using less specific mass approaches.

PATIENT-PROVIDER RELATIONSHIP-CENTRIC INFORMATION SYSTEM

What capabilities should a patient-provider relationship-centric information system provide? First, as with Merrill Lynch, such a system must have an easy-to-use shell that smoothly integrates with all information systems already in use. The user does not need to know where the

information came from; it should look the same whatever the source. The system should be based on off-the-shelf hardware and software, to insure easy integration of new functions. It should be easily configurable for individual users. For example, patient appointment workers use some parts of the system more than others. Configure their screens to show the information they need most often; leave less often used information a few mouse clicks away.

The ability to add additional demographic data is useful. Military examples include unit assignment, unit leadership names and phone numbers, and projected reassignment date. Authorized providers and support staff must be able to change most demographic information, and patients should be able to change items such as home phone number, address, and e-mail address, through the Internet. Changes entered should be automatically available to all users, so time and effort are not wasted making repeat entries.

Powerful search functions must allow providers to find patients by scraps of information such as first name, the last four numbers of the patient ID, or phone number, because often that is the way people take notes. These search functions can identify groups of patients who may be candidates for a new prevention screen or practice guideline. An example would be identifying all women of

childbearing age who are not sterile, so that they can be assessed for vitamin supplementation, and thus reduce the risk for birth defects.

Reminder scheduling functions are essential. Providers can schedule patient follow-up activities such as phone calls, e-mails or visits. Other pending activities, such as writing a letter to a previous physician to obtain past testing results, or obtaining records from another hospital, can also be recorded. The ability to schedule recurring events makes follow-up of chronic illness or yearly screenings more consistent. This allows providers to be proactive, rather than waiting for patients to come in. Rolling over or rescheduling events that did not occur prevents past-due prevention screens from being forgotten.

E-mail from within the program provides another means of communicating with patients. Automatic recording of contact attempts, whether by phone or e-mail, documents providers' attempts to provide or encourage appropriate care. Ability to attach e-mails, faxes, letters, and other documents to the patient record screen provides additional means of documentation.

A summary of these features most critical for providers is presented in Table 1.

| FEATURE | RATIONALE |
|---|--|
| Search | Data mining |
| Reminder | Patient/provider reminder of scheduled or recommended visits |
| Rollover | Patient/provider reminder of missed care |
| E-mail | Additional communication means |
| Automatic record of reminders, messages | Improved medical records |

Table 1: Essential Features of Provider-Patient Information System

Where can these capabilities be found? Although medical computer systems have proliferated, especially those dedicated to practice management, their viewpoint is business oriented. They facilitate the provider's relationship with third party payers. One large company, Medical Manager Corporation, produces a medical practice management program whose clinical package has prevention recommendations. These recommendations appear when the patient comes in for an appointment: they are printed on the patient visit record.²¹ This does promote prevention, but only if the patient makes an appointment.

The patient-provider relationship is similar to that of salesman-customer. A patient-provider "sales" relationship in the context of "selling health" by promoting prevention is analogous to the relationship of the financial consultant

at Merrill Lynch to his customer. If the clients of a financial consultant do better as a result of his portfolio management, so does he. If patients do better because the provider is implementing a good prevention and health promotion program, the managed care provider does, too.

Important to both relationships is the ability to reach out proactively to patient or client. Suppose the only time the financial manager gave advice or managed a portfolio was when the client called. This is analogous to the current practice of only advising on prevention measures or implementing practice guidelines when the patient makes an appointment, usually for another reason.

There are a number of off-the-shelf sales contact management programs that can facilitate the patient-provider relationship. These programs contain many of the features providers need to effectively manage patients. Table 2 contains a list of the most significant of those, and compares them to current systems on line or pending in the Military Health System.

| Program | CHCS | CHCSII | ACT!® | GoldMine® | PCHA |
|----------|------|--------|-------|-----------|----------|
| Feature | | | | | |
| search | | | x | x | |
| reminder | | | x | x | |
| rollover | | | x | x | |
| e-mail | x | x | x | x | X (CHCS) |
| document | | x | x | x | x |

Table 2: Availability of Essential Patient-Provider Information Capability

The Composite Health Care System (CHCS) now in use in the military health system was created primarily for in-hospital use. CHCS II is the update of CHCS that provides much more robust outpatient health care support. The Preventive Health Care Application (PCHA) is an early deployment of part of CHCSII, and implements prevention services, as well as immunization tracking and health assessment. These are excellent programs, but do not have some features needed to maximize the ability of providers to pursue proactive prevention for their patients. This is not to say that the features are not present somewhere in CHCS, or that there are no work-arounds that could emulate these features. However, ease of use (not a strong point of CHCS) is a significant element of whether or not a given feature is effective: a program easily accessed and intuitively navigated is more effective than a powerful program that requires an expert user.

Act!^{®22} and GoldMine^{®23} are two commercial contact management programs. They do provide the features discussed. They would require modification for application to health care and integration with existing medical systems. Act![®] is especially easy to use. It has a powerful database engine, allows easy addition or deletion of information fields, has versatile scheduling functions,

and offers robust reporting capability. As a database, it is easy to search, either for individual patients, groups (all patients with hypertension), or subgroups (all patients with hypertension seen within the last month who are taking a particular medication).

These commercial programs may not be the best for medical organizations to adopt. The concept at their core, a design that makes it as easy as possible for salesmen (providers) to give service to their customers (patients), is a lesson medical information planners should take to heart. The corollary, that the program should make it as hard as possible not to do the right thing, is equally important.

IMPACT OF CHANGE ON PATIENT HEALTH

How will adopting this technology affect the practice of medicine, patient health, and the patient-provider relationship? Clearly, there will be increased compliance with prevention, disease screening, and health promotion initiatives, although how much is hard to determine. A number of things must be done simultaneously.

First, we must identify what prevention and wellness initiatives to implement. A national consensus exists. The Agency for Health Care Policy and Research now manages Put Prevention into Practice (PPIP).²⁴ This is a set of recommendations for screening, immunizations, and counseling

that is research based and would have a clear impact on the health of the nation if implemented widely. Healthy People 2000, soon to be Healthy People 2010, is another such program. It is well established that implementation of these programs can prevent death and disability from disease. For example,

...cancer incidence and death rates for all cancers combined and for most of the top 10 cancer sites declined between 1990 and 1995. The figures demonstrate that prevention does work; according to the authors, decreasing mortality from breast cancer in white women most likely is a reflection of the increasingly widespread diffusion of breast cancer screening into routine medical care.²⁵

It is also well established that physicians do not regularly counsel their patients against unhealthy practices, nor always do appropriate prevention tests and procedures. In one study, physicians advised smokers to quit only 21% of the time. Another showed that physicians tend to do only 20 to 60 percent of recommended testing or screening.²⁶ Adopting this technology will increase the percentage of patients counseled. Although ultimate change in behavior is hard to predict, it is likely some will respond.

The next issue is implementation of clinical practice guidelines. There are about 1900 guidelines published.²⁷ New ones constantly appear, and old ones are often revised. Many of these guidelines are for specific clinical situations and are not generally applicable to the primary

care provider, of course. It would be difficult to ensure that all applicable guidelines were implemented for each person eligible.

This is where automation can make the difference. Creating a system with automatic reminders to the provider for preventive screening and testing, and to counsel on specific unhealthy or injury prone activities at regular intervals, would not be difficult.

Easy scheduling of time-related activities (such as yearly mammograms or Pap smears) contained in practice guidelines, with reminders that are hard for patient or provider to evade or erase until complete (unless the patient just refuses the care), provides an additional safety net. Overlaying practice guidelines onto patient care plans, followed unless the provider supplies an exception for a particular patient, ensures uniform quality of disease treatment, without denying individuality of patient care.

The most essential part of this system is that the provider goes out to the patient to initiate these measures, rather than waiting for the patient to come to him. If we can do this, the patient-provider relationship will strengthen, perhaps leading to greater compliance with prevention and wellness measures, and ultimately better health.

There may be a paradoxical effect in such an approach. One gross measure of population health is number of provider appointments per year per patient: the fewer the appointments, the healthier the population. A proactive system may actually result in higher numbers of appointments overall. While appointments for acute illness may decrease, the number of visits for wellness counseling and prevention screening would probably increase. From a resource standpoint, this would be more than compensated for by a decrease in the number of hospitalizations and an increase in overall health.

WHAT THE FUTURE HOLDS

The future is always difficult to predict. The speed of information technology change is so great and speed of implementation so varied, tremendous differences can exist between organizations as they build their "digital nervous systems."²⁸ The Internet will become a prime means of interaction between patient and provider for prevention, counseling and health monitoring. Access to personal medical records will allow proactive patients to schedule appointments (also via Internet) for those measures that need physical examination or procedures. Better access to broadband Internet access may allow video messages or video appointments and consultations. Increased computing power available to home medical devices, such as blood pressure

cuffs and blood glucose testing machines, may allow them to connect to the Internet to transfer data to the patient's medical record, with filters to evaluate the information and alert a provider if necessary.

Medical records will be Internet based: each patient will have a single secure and permanent Web site. One medical record, regardless of the source of care, will make continuity easier. Authorized information devices such as laboratory analyzers, EKG machines, and radiology imaging devices will access the Web site to deliver results. Design of the Web site will be standard, so that any authorized provider would see the same patient information in the same place. To get up-to-date lab results, with explanations oriented towards laymen, the patient would simply access his own web site.

A patient's provider would receive an e-mail message whenever results were posted to the Web site, and he could quickly access the site, evaluate the lab results, write a note to the patient, and order any additional testing or medications. The patient would e-mail the prescription to the pharmacy (it could be automatically forwarded if desired). The pharmacy would authenticate the prescription on the Web site and check for incompatibilities with other active medications or allergies. Finally, it would mail the

medication and e-mail appropriate instructions to the patient .

There are many possibilities. What is sure is that there will be change, it will be rapid, and we must keep up.

CONCLUSION AND RECOMMENDATIONS

Information technology in medicine has great potential for improving the health of our population. Information systems must center on providers, patients, and their relationship and access to information, if we are to see those improvements. We must create systems that facilitate the provider's ability to synthesize and execute a comprehensive health plan that includes prevention, health promotion, and wellness, as well as incorporating practice guidelines, in a positive and proactive manner. We must project health care from the clinic into the home via the Internet, initiating contact with the patient rather than waiting for the patient to come to us. We must continuously survey available technology to create and extend such patient-provider centric systems.

WORD COUNT = 4844

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